FIELD METHODS FOR DETERMINING THE SEX OF BARN SWALLOWS (*HIRUNDO RUSTICA*)[1]

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ABSTRACT

The purpose of this study was to determine whether wing length (measured on museum skins), tail length (measured on museum skins), breast color (observed in the field), or behavior (observed in the field) could be used to sex Barn Swallows. Differences in wing-chord lengths of male and female study skins were not significant. Outer rectrice lengths of male study skins were significantly longer than females; thus, tail measurements could prove quite useful as a sexing technique in the field. Differences in breast color (measured visually as buff, light orange, medium orange, or dark orange) could not be correlated with sex. Breast colors of 24 males which attempted to copulate with a mount placed in the field were equally buff, light orange, medium orange, or dark orange. Copulatory behavior was used to sex paint-marked birds in the field, and indications are that other behavior patterns, such as that of following, may also be useful.

Usual field methods for sexing passerine species involve coloration, brood patch, or feather length. While carrying out a study on the breeding biology of Barn Swallows (*Hirundo rustica*) (Samuel, 1969), it was desirable to sex birds in the field without sacrificing them. Proposed methods for sexing Barn Swallows include differences in breast color (Bent, 1942; Chapman, 1912) and in tail length (Vietinghoff-Riesch, 1964). It was the purpose of this study to determine whether these or any other methods could be used to sex Barn Swallows.

METHODS

A total of 118 Barn Swallows was mist-netted during this study. These birds were captured in study areas near Bruceton Mills and near Terra Alta, Preston County, West Virginia. All birds were banded, and paint-marked for identification after release (Samuel, 1970), and some were also behaviorly sexed (based on copulation attempts on a mounted Barn Swallow) in the field. In addition to copulation, other behavior patterns which might be used to sex adult Barn Swallows were observed. Male birds follow females during activities around the barns, and while feeding, so observations were kept on perching and following in marked Barn Swallows where pairs had been sexed on the basis of earlier observations of copulation attempts.

Measurements taken at the time of banding were: (1) wing-chord length, measured by placing the carpal joint of the closed wing on a metric rule and pivoting the wing downward until the tip of the tenth primary touched the rule; (2) tail length, measured by inserting a metric rule to the base of the outer rectrice; and (3) breast color, measured visually as buff, light orange, medium orange, or dark orange. The accuracy of these color assignments was checked as marked birds were recaptured; four of 35 recaptured birds (14 percent) had been placed in the wrong category, but none had been misplaced by more than one category (e.g., light orange to dark orange).

Measurements of wing length, tail length, and breast color were also made on known-sex museum specimens. These included 40 known-sex birds in the Carnegie Museum collections (Pittsburgh, Pennsy.vania). In addition, breast colors were recorded for those live males which were captured, which were observed in the field in pairs, and which attempted to copulate with the Barn Swallow mount.

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RESULTS AND DISCUSSION

Wing-lengths measurments of study skins of male and female Barn Swallows were not significantly different ($p > .05$) (Table I). The lengths of outer tail feathers reportedly (Vietinghoff-Riesch, 1964) can be used to sex *Hirundo* in Europe. In this study, measurements of museum skins revealed that males did indeed have longer outer tail feathers than did females, so this method should give good results when sexing Barn Swallows in the field.

TABLE I

Wing and Tail Lengths (mm) For Barn Swallows. The First Group were Live Trapped on the Study Area. The Second Group were Study Skins in the Carnegie Museum Collection, Pittsburgh, Pennsylvania. These Birds Were Collected From All Parts of the United States. N = *Sample Size,* $\bar{X}$ = *Mean,* s = *Standard Deviation,* $^s\bar{X}$ = *Standard Error of the Mean*

	N	$\bar{X}$	s	$^s\bar{X}$
Group I				
wing, both sexes*	91	119.5	±1.7	.18
tail, both sexes*	89	83.1	±0.8	.09
Group II				
wing, male	23	116.8	±0.3	.07
wing, female	17	115.1	±1.4	.28
tail, male	23	85.4	±0.4	.07
tail, female	17	73.4	±2.5	.61

*Data combined because insufficient numbers of birds were of confirmed sex based on observed copulations.

In terms of breast color, significantly more light-orange-breasted birds were observed, both as captures in the study areas and as study skins in the Carnegie Museum (Table II). Of pairs of birds observed perching together, more light-orange-breasted birds were observed (Table II). A mount of a female Barn

TABLE II

The Number of Barn Swallows Per Breast Color Class For; Adults Captured on the Study Areas, Known Sex Museum Skins and Observed Pairs

Color Class	Captured	Study Skins		Pairs	Totals
buff	16	males 2 females 4	6	27	49
light orange	46	males 10 females 7	17	33	96
medium orange	22	males 9 females 6	15	14	51
dark orange	22	males 4 females 3	7	14	43
Totals	106(1)	45(2)		88(3)	239(4)

(1) when testing Ho that $p = \frac{1}{4}$ light orange, $x^2 = 19.0$*
(2) when testing Ho that $p = \frac{1}{4}$ light orange, $x^2 = 3.9$*
(3) when testing Ho that $p = \frac{1}{4}$ light orange, $x^2 = 7.9$*
(4) heterogeneity $x^2 = .9$, hence data in each group are consistent and can be pooled. Pooled $x^2 = 29.9$*
*Significant at the .05 level.

Swallow was placed on a fence once per site visit and counts of attempted copulations were made. Males in the area immediately responded with copulation attempts, at which time breast color of these males was visually recorded (Table III). Because the sample size is small, no definite conclusions can be drawn. However, some birds with buff- and light-orange-colored breasts did attempt copulation. This does not support Bent (1942) and Chapman (1912), who report that male Barn Swallows have dark-orange breasts. Vietinghoff-Riesch (1964) has suggested that, in Europe, breast color differences may be due to a number of different races of *Hirundo*. However, the fact that male birds with different-colored breasts were found in the same barn or seen paired makes the hypothesis doubtful. Rather, all the above data support the idea that breast color is not a good indication of sex.

TABLE III

The Number of Breast Color Classes For 24 Adult Male Barn Swallows Which Attempted Copulation With A Taxidermy Mount

Breast Color Class	Number
buff	4
	>non significant difference
light orange	8
	>non significant difference
medium orange	6
	>non significant difference
dark orange	6

Observation of copulation attempts did appear to be a good method for determining the sex of live, free birds. It is suggested, therefore, that other behaviour patterns may also be useful. Preliminary results, based on observations of the sexed, paint-marked birds in this study, indicate that male Barn Swallows follow females more than females follow males. Also, the female appeared to be the first bird in a pair to leave a perch, followed by the male.

It should be pointed out that some of these observed characteristics may vary with age. For example, juvenile birds all have white or light-orange breasts. Therefore, it is possible that orange coloration may develop with age. No such change in color was noted in the few birds recaptured in 1968, but future recaptures may support this hypothesis. The outer tail feathers also presumably grow as Barn Swallows get older, as pointed out by Vietinghoff-Riesch (1964). The fact that Barn Swallows with dark-orange breasts have longer tails than do those with light-orange breasts (Table IV) provides indirect evidence for the hypo-

TABLE IV

Tail Lengths (CM) of Barn Swallows With Buff, Light Orange, Medium Orange and Dark Orange Breasts. All Birds Were Captured on the Study Area

Breast Color	Tail Length	N	
buff	8.08	14	
light orange	8.25	38	*
medium orange	8.30	16	
dark orange	8.59	21	

*Mean differences were non-significant.

thesis that older birds have both darker breasts and longer tails. However, more data would be needed to demonstrate the validity of these hypotheses.

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